6, 7, 8. Various stages in the variations from scales to leaves in the same, × ½.

9. Scales and leaves removed, showing an aborted flower of the season.

10. The spadix taken from the same.

11. The spadix of a normal flower, × ½.

12. A spadix, the regular spathe broken away, revealing an abnormal second spathe at the base of the spadix.

13. The arrangement of two successive terminal stems of the plant, with their leaf appendages. The leaves are successively numbered, No. III. in each case signifying the spathe, the position of the second spathe being indicated in the first stem.

14, 15. Two methods of representing the arrangement of the plant as it might be expected to exist if the normal one third arrangement were adopted. In Fig. 15 No. II. should be on the second line, not the first.

16. The position of the "flowers" and leaf buds, irrespective of leaves or scales: *a*, *e*, *f* represent membranous aborted spathes; *b*, *c*, *d* represent the bases of the stalk supporting the flowers which arrive at perfection. The remaining flowers are also aborted, although it is barely possible that *l* or *m* are far enough along in the series to develop into mature flowers next season.

17. The same uncoiled and more graphically represented.

18. A vertical section of one of the true flowers while still in the bud, × 2.

The Fresh-water Algæ of Maine.—I.

By F. L. Harvey.

The species of Maine Algæ enumerated below were observed during the fall of 1887.

The gatherings were taken from sheltered coves and pot-holes along the Penobscot in the vicinity of Orono; also from the clear running water of spring brooks, and from Chemo Pond and stream five miles east of Orono. Quite a number of species were observed in the stagnant water of an old well on the college farm.

As no observations have before been published upon the fresh-water algæ of Maine, it is thought best to include, with the novelties, all the species observed, for the purpose of showing geographical distribution.

Descriptions are given of the new forms and those not observed before in the United States.

Some of the forms should be figured, but there are not enough to make a full plate, so it is thought best to defer the illustrations until more observations are made, and include them with others in another contribution.

The references to plates and figures are to Wolle's Desmids and Fresh-water Algæ of the United States. The systematic arrangement of the species is that given in the same works.

The writer is greatly obliged to Mr. Wolle for professional

courtesies, the majority of the species enumerated having been confirmed by him.

CLASS I.—RHODOPHYCEÆ.

Family III.—Batrachospermaceæ.

1.—*Batrachospermum moniliforme*, var. SUBULATUM, n. var. —A small form, dusky purple, whorls dense, barely distinguishable except by crushing; branches and branchlets terete, somewhat tapering, with a slightly wavy outline; tufts one-half to nearly one inch high. Mr. Wolle considers this a distinct variety. Whether possibly only a condition of growth, remains for future observation to determine. Plentiful on rocks and in pot holes on the Penobscot river at Old Town. October.

CLASS II.—CHLOROPHYCEÆ.

Family VI.—Œdogoniaceæ.

2. *Bulbochæte rectangularis*, Wittr., p. 102, Pl. XC.—In an old well on the college farm. Oct. In fruit. A species of Œdogonium is associated with the above, but the specimens were sterile at the time of examination and not determinable.

Family VIII.—Confervaceæ.

3. *Draparnaldia glomerata*, Ag., p. 108, Pl. XCII.—In constructing a dam across the Penobscot at Old Town quite a number of pot holes were exposed, and in these the above species was found in abundance, associated with the *Batrachospermum* mentioned above. Oct.

4. *Stigeoclonium subsecundum*, Kg., p. 112, Pl. XCIX. In an old well on the college farm, which has been filled to within a few feet of the surface. Plentiful. Oct. Interesting as the only locality given by Wolle is South Carolina.

Specimens of *Ulothrix* were also observed in a gathering from the Penobscot, but were not in a condition for specific determination.

Family XII.—Volvocaceæ.

5. *Volvox globator*, L., p. 158, Pl. CLI.—Found sparingly in several gatherings from pools and small ponds about Orono.

6. *Pandorina morum*, Bory., p. 161, Pl. CLIII.—In stagnant pools. Much more common in gatherings made than *Volvox*.

Family XIII.—Protococcaceæ.

7. *Scenedesmus obtusus*, Meyen., p. 173, Pl. CLVI.—Found in a gathering made from a small pool near the Penobscot, and which stood for two months in the laboratory before it was examined. Plentiful. Oct.

8. *Sciadium arbuscula*, A. Br., p. 174, Pl. CLVII.—Two or three specimens observed in the water of the old well. The specimens invariably had eight rays in the umbel and were simple.

Family XVI.—Palmellaceæ.

9. *Dictyosphærium reniforme*, Bulnh., p. 186, Pl. CLVI.—Quite plentiful in a pool near the Penobscot, opposite Great Works, collected by Mr. L. H. Merrill.

10. *Glœocystis ampla*, Kg., p. 196, Pl. CLXVI.—Common in standing water about Orono. Pool near Penobscot at Great Works (Mr. L. H. Merrill).

11. *Raphidium polymorphum*, Fres., var. *contortum* (Thur.), Wolle, p. 198, Pl. CLX.—Rather common in pools and small ponds near Orono.

12. *Eremosphæra viridis*, D. By., p. 200, Pl. CLXVII.—Very abundant in a gathering made near Great Works by Mr. L. H. Merrill.

Specimens, shedding the membranous envelope, undergoing fission and forming reddish brown resting spores, were observed.

Family XVI.—Conjugatæ.

13. *Zygnema insigne*, Kg., p. 223, Pl. CXLIII.—Common in small spring brooks and ponds. Finely in copulation. Oct.

14. *Zygnema anomalum* (Hass.), Kg., p. 224. This interesting form was collected in abundance in a small spring pond near Orono by Roy Harvey. The colorless gelatinous sheath soon after gathering is liable to become almost invisible. Filaments with sheath, in our specimens, measured 40 μ; without sheath, 22 μ. The specimens were all sterile, though collected from a spring in December, after the pond had been frozen for two months. They were in fine vegetative condition.

15. *Zygogonium pectinatum*, Kg., p. 225, Pl. CXLV.—Abun-

dant in pools along the banks of the Penobscot, also in ponds and springs inland. Finely in fruit. Oct.

Several species of *Spirogyra* occur in abundance in Maine waters, but none have yet been found by me in conjugation.

Family XVII.—Desmidieæ.

16. *Hyalotheca disilliens* (Smith), Breb., p. 22, Pl. I.—Very common in sheltered places along the Penobscot, and in small ponds, springs and stagnant pools.

17. *Desmidium Swartzii*, Ag., p. 26, Pl. II.—Common in shallow streams, small ponds and ditches.

18. *Sphœrozosma pulchrum*, Bailey, p. 29, Pl. IV.—Old well on college farm. The gelatinous envelope was apparent in our specimens.

19. *Penium Digitus* (Ehrb.), Breb., p. 34, Pl. V.—Pot holes at Old Town. Pool at Great Works in gathering made by Mr. L. H. Merrill.

20. *P. interruptum*, Breb., p. 35, Pl. V.—Both large and small forms observed in gatherings made at Old Town and Great Works. Not plentiful.

21. *P. Brebissonii* (Menegh.), Ralfs, p. 36, Pl. V.—Pools along the enobscot. Not scarce.

22. *Closterium Lunula*, Ehrb., p. 40, Pl. L.—Pot hole at Old Town; also from Great Works in gatherings made by Mr. Merrill.

23. *C. Cucumis*, Ehrb., p. 40, Pl. VI.—Pools in Penobscot, at Old Town and elsewhere in ponds.

24. *C. striolatum*, Ehrb., p. 42, Pl. VI.—Pools near the Penobscot at Orono. From a gathering made by Mr. Merrill near Basin Mills.

25. *C. Venus*, Kg., p. 44, Pl. VII.— Pot holes at Old Town.

26. *C. Ehrenbergii*, Menegh., p. 45, Pl. VII.—Pools near the Penobscot at Great Works in gatherings made by Mr. Merrill. Also from various small ponds about Orono.

27. *Docidium Trabecula* (Ehrb.), Næg., p. 48, Pls. IX., XI.—(*D. Ehrenbergii*, Ralfs).—Common in stagnant ponds and sphagnum swamps. Orono.

28. *Cosmarium granatum*, Breb., p. 60, Pl. L.—From a gath-

ering made in a pool near the Penobscot, and which stood in the laboratory two months before examination.

29. *C. tumidum*, Lund., p. 61, Pls. XV., XVIII.—Pools along the Penobscot.

30. *C. Meneghinii*, Breb., p. 65, Pl. XVI.—From the gathering which stood in the laboratory.

31. *C. undulatum*, Corda., p. 67, Pl. XVI.—Pools at Old Town, Great Works, etc.

32. *C. crenatum*, Ralfs, p. 67, Pl. XLIX.—Pools and shallow ponds along the Penobscot.

33. *C. pyramidatum*, Breb., p. 69, Pl. XIV.—Pool on the college farm.

34. *C. pachydermum*, Lund., p. 70, Pl. XV.—Pool near the Penobscot, on the college farm.

35. *C. Botrytis*, Menegh., p. 74, Pl. XIII.—Pools near Old Town, Great Works and Orono.

36. *C. dentatum*, Wolle, p. 76, Pl. XIII.—Pools along the Penobscot, Orono.

37. *C. amœnum*, Breb., p. 78, Pl. XIV.—From gathering near Penobscot, which stood in laboratory for two months before examination.

38. *C. sublobatum*, Archer, p. 80, Pl. XVIII.—With the above.

39. *C. Quasillus*, Lund., p. 84, Pl. XVII.—With the above. The form observed was more robust than that figured by Wolle.

40. *C. Broomei*, Thwaites, p. 86, Pl. XVII.—Common in pools and ponds, Orono.

41. *Xanthidium cristatum* (Breb.), Ralfs, p. 93, Pl. XXI.—Old well, college farm, Orono.

42. *X. fasciculatum*, var. *subalpinum*, Wolle. Wolle, Fresh Water Algæ U. S., p. 34, Pl. LVI.—Old well, college farm, Orono.

43. *X. antilopœum* (Breb.), Kg., p. 94, Pl. XXIII.—Old well, college farm, Orono. Plentiful.

44. *Arthrodesmus convergens* (Ehrb.), Ralfs, p. 95, Pl. XXIII.—Old well, college farm, Orono.

45. *Euastrum verrucosum* (Ehrb.), Ralfs, p. 100, Pl. XXVI. —The type form is common in pools at Old Town, Great Works and Orono, associated with the variety mentioned below.

46. *E. verrucosum*, var. *simplex*, Joshua.—This form is new to the U. S. In a paper dated February, 1885, Wm. Joshua, F. L. S., Eng., describes this variety from specimens collected at Pictou, Canada. His diagnosis is as follows: "Of stout habit, terminal lobes very short and with very shallow incisions, central inflation either none or very small; no other. Length, 85 μ; width, 65 μ; apical lobes, 35 μ wide; thickness, 25 μ."

The nearest form to this variety is *Cosmarium trilobatulum*, Reinsch, but not smooth like it, and somewhat larger. It is granular throughout, but most densely at the angles of the lobes. It appears to stand on the border between *Euastrum* and *Cosmarium.*

Shallow pools along the Penobscot at Old Town, Great Works and Orono. Sparingly in the water of springs and sphagnum swamps. Associated with the type form.

47. *E. elegans*, Kg., p. 106, Pl. XXVII.—In gatherings from Great Works (Merrill). Also in shallow pools and ponds, Orono.

48. *E. binale* (Turpin), Ralfs, p. 107, Pl. XXVII.—Associated with the above.

49. *Micrasterias rotata* (Grev.), Ralfs, p. 109, Pl. XXXIV.—From gathering which stood in laboratory two months. Penobscot, near Orono.

50. *M. denticulata* (Breb.), Ralfs, p. 109, Pl. XXXIV.—With the above.

51. *M. Americana* (Ehrb.), Kg., p. 112, Pl. XXXII.—From old well on college farm, Orono.

52. *Staurastrum Avicula*, Breb., p. 123, Pl. XL.—Old well, college farm, Orono.

53. *S. polymorphum*, Breb., p. 126, Pl. XLII.—Old well, college farm; also in stagnant water of small ponds; common.

54. *S. crenulatum* (Næg.), Delp., p. 126, Pl. XLII.—Old well, college farm; also in many ponds about Orono; common.

55. *S. punctulatum*, Breb., p. 127, Pl. XLI.—Pot holes in Penobscot; also in shallow pools, Orono.

56. *S. pygmæum*, Breb., p. 128, Pl. XLII.—From the gathering taken near the Penobscot that stood in the laboratory two months.

57. *S. cyrtocerum*, Breb., p. 128, Pl. XLII.—Small pools and ponds about Orono.

58. *S. macrocerum*, Wolle, p. 134, Pl. XLIII.—Chemo pond, five miles east of Orono.

59. *S. Sebaldi*, Reinsch, p. 138, Pl. XLVI.—Old well, college farm, Orono.

60. *S. Brebissonii*, Arch., p. 141, Pl. XLV.—Old well, college farm. Interesting, as Florida was the only habitat before known.

61. *S. Saxonicum*, Bulnh., p. 141, Pl. XLV.—Pools along the Penobscot at Old Town and Great Works.

62. *S. Saxonicum*, Bulnh., var. PENTAGONUM, n. var.—Structure similar to the type form; size slightly smaller, 62 μ diameter; end view pentagonal; sides somewhat concave or straight.

First observed in gatherings from a shallow pool on the bank of the Penobscot at Old Town. Later it was found at other points along the river about Orono. It is usually associated with the type form.

63. *S. furcigerum*, Breb., p. 146, Pl. XLVIII.—Pot holes and pools, Penobscot River, Orono.

64. *S. spongiosum*, Breb., p. 148, Pl. XLVII.—Pools along the Penobscot, Orono.

CLASS III.—CYANOPHYCEÆ.

Family XVIII.—Nostocaceæ.

65. *Tolypothrix muscicola*, Kg,, p. 264, Pl. CLXXXI.—Old well, college farm. Plentiful.

66. *Hapalosiphon Braunii*, Kg., p. 275, Pl. CXCVI.—With the above.

67. *Nostoc comminutum*, Kg., p. 282.—Abundant in a gathering made from a pool in the Penobscot at Great Works by Mr. Merrill.

68. *Nostoc rupestre*, Kg., p. 283, Pl. CXCVII.—This form was found in a lake near Houlton, Me.

Several species of *Oscillaria* have been observed, but they have not yet been studied enough to give determinations.